MANAGING THE RATE OF DELIVERING PERFORMANCE INTERVENTIONS IN A CONTACT CENTER

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation in part of U.S. patent application Serial Number 10/602,804, filed June 24, 2003, which is a continuation of U.S. application Serial Number 09/442,207, now U.S. Patent Number 6,628,777, entitled "Method and System for Scheduled Delivery of Training to Call Center Agents," issued September 30, 2003.

This application is related to U.S. Non-Provisional Patent Application, serial number unassigned, entitled "Managing the Selection of Performance Interventions in a Contact Center," filed December 11, 2003 and having attorney docket number 07117.105017.

TECHNICAL FIELD

The present invention relates generally to contact centers, such as call service centers, and more specifically to managing the rate of delivering performance interventions, such as training sessions, for agents in a contact center.

BACKGROUND OF THE INVENTION

A contact center, such as a call center, is a system that enables a staff of agents to service telephone calls to or from customers or other constituents. Modern contact centers generally incorporate computer-based systems for automatically handling calls and managing various operational aspects of the contact center. Contact center operations benefit from the recent availability of automated systems that deliver performance interventions, such as training content, to agents via a computer terminal.

Agents in contact centers and other constituent service centers must be well-trained in order to maximize their productivity and effectiveness. Agent training must be intensive and frequent in centers that handle complex interactions

with constituents or that change call scripts or other interaction programs often. In many situations, the quality and effectiveness of agent training may significantly drive the performance of the contact center.

In conventional contact centers, training is provided to contact center agents through a variety of mechanisms. The supervisor of the contact center may simply walk over to individual agents, place telephone calls to the individual agents, or pass on new information to the agents personally. New information may be distributed by email, by an instructor in a classroom setting, or over an intranet. Alternatively, the information may be broadcast over a public announcement system or may be displayed on a large wall display at the front of the contact center. New information may also be provided through a "chair drop" by which written information updates or training materials are handed to the agents for their consumption.

More recently, automated methods for agent training and information updating have been developed. Computer-based training ("CBT") involves the distribution of training programs to an agent's computer desktop. CBT content may be distributed in a broadcast mode, with each agent receiving the same training at the same time. CBT may more effectively be deployed by allowing individual agents to access desktop training on their own schedule and at their own pace through self-directed CBT. In self-directed CBT, each agent takes the initiative to enter a training session, and the pace and content of the training can reflect individual agent learning rates and base knowledge.

While computer-based training methods offer significant benefit in training effectiveness, efficiency, and sophistication to contact centers and other constituent contact centers, conventional CBT-based training regimens have significant drawbacks. Broadcast CBT systems generally require that a group of agents be diverted en masse from their customer interaction duties for a period of time, and those systems do not accommodate large variations in learning rate or base knowledge among agents. While self-directed CBT enables agents to learn at their own pace and to enter training sessions when they wish, conventional self-

directed training is not generally amenable to centralized management and control by the contact center. Furthermore, self-directed CBT generally does not support a coordinated approach to training or facilitate controlling the number of training sessions conducted in an increment of time. Without such coordination and control of training rate, the contact center's short-term operational effectiveness can be adversely impacted by training. Because of the limitations of convention CBT and other performance interventions, conventional contact centers may forego providing agents with performance interventions in order to meet short-term performance objectives. Conversely, such contact centers may compromise short-term performance in order to meet long-term training objectives.

In addition to failing to balance short- and long-term objectives, conventional contact centers do not generally deliver performance interventions in a manner that adequately responds to changing conditions, such as fluctuating call volume and contact center performance. More specifically, conventional contact centers generally neither set the number of performance interventions delivered in an increment of time nor select performance interventions for delivery on the basis of such dynamic conditions.

Rather than respond dynamically to changing conditions in the contact center, contact centers often rely on conventional schedules to dictate a timeframe for delivering performance interventions. A member of the contact center's management staff usually drafts such schedules manually. Often drafted weeks in advance, the schedules are typically fixed and can not easily accommodate the inherent uncertainty and fluid nature of the contact center's operations. Consequently, such static schedules are limited in terms of capability to adjust the number of interventions delivered in an increment of time in response to the dynamic conditions of a contact center.

Another problem with conventional approaches to scheduling performance interventions in a contact center is related to the management staff's approach to generating agent work schedules. Management typically generates work schedules for the contact center's agent staff weeks in advance. Generally,

management devises these schedules with the goal of maximizing the time that each agent spends servicing contacts. Management typically prefers a schedule that keeps the agents too busy rather than a schedule that provides excess idle time. This approach not only serves short-term profit objectives, but also compensates for unanticipated lulls in the contact center's activity levels. Consequently, conventional agent schedules usually provide insufficient time for conducting performance interventions. In other words, from a planning perspective, the contact center typically does not have sufficient available time on the schedule to provide a desirable level of performance interventions.

Although conventional schedules do not usually accommodate an adequate level of performance interventions, the actual operations in a contact center frequently deviate substantially from the planned activities. In an ordinary day, unexpected circumstances and/or randomness cause decreases in call volume which offer an opportunity to deliver one or more performance interventions. However, conventional scheduling methodologies generally do not provide for utilizing such unexpected available time. In other words, a contact center typically has incremental downtime that is underutilized for delivering performance interventions because conventional schedules typically lack provisions for its utilization.

What is needed is a capability for managing the number of performance interventions delivered in a contact center in an increment of time in a manner that is responsive to changing conditions in the contact center. This capability should adjust the rate of performance intervention delivery according to activity levels and performance of the contact center. Such a capability would promote the overall performance and proficiency of the agent population in the contact center without compromising the performance of the contact center during performance intervention delivery.

SUMMARY OF THE INVENTION

The present invention supports managing performance intervention delivery to agents in a contact center. A performance intervention can be a communication delivered to an agent with the intent to enhance the performance, proficiency, and/or effectiveness of that agent. Computer-based training can be an example of a performance intervention. A contact center can be a system staffed with agents who service customers or constituents though a communication network. An inbound call center can be one example of a contact center.

According to one aspect, the present invention can manage performance intervention delivery by controlling the rate of delivering performance interventions to agents in a contact center. Delivery rate can be the number of performance interventions for which delivery is initiated or completed in an increment of time, such as a day, an hour, or a second. Factors that describe or effect a contact center's operations can be characterized as contact center state. The rate at which the contact center services contacts or receives incoming calls are two examples of contact center state. Contact center state can also be a measurement of the center's performance, such as the average time that a contact waits prior to receiving service from an agent. The present invention can control the rate of delivering performance interventions based on a current or a forecasted state of the contact center.

According to another aspect of the present invention, management input, such as an input level of contact center state, can be a factor in managing performance intervention delivery. A computer program can compute an intervention delivery rate based on the management-input state level and a current or a predicted contact center state. The computer program can adjust the rate of delivering performance interventions to maintain contact center performance at or above a management-input performance level. Contact center performance dipping below the level can trigger a decrease in the performance intervention delivery rate. Similarly, performance rising above the level can trigger an increase in intervention delivery rate.

According to another aspect of the present invention, a computer program can select agents to receive performance interventions in conjunction with determining a rate for delivering performance interventions. Agent selection can be based on need. Lower performing agents can preferentially receive performance interventions over higher performing agents. Ranking the relative performance of each agent in a group of agents can define a sequence for delivering performance interventions to the group.

The discussion of managing performance intervention delivery presented in this summary is for illustrative purposes only. Various aspects of the present invention may be more clearly understood and appreciated from a review of the following detailed description of the disclosed embodiments and by reference to the drawings and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a block diagram illustrating a system for managing a computer-based customer call center system in accordance with an exemplary embodiment of the present invention.

Figure 2 is a block diagram illustrating a system for the scheduling and delivery of training materials in accordance with an exemplary embodiment of the present invention.

Figures 3A, 3B, and 3C are flow charts indicating the steps in the methods for training a contact agent to perform constituent contact duties in accordance with an exemplary embodiment of the present invention.

Figure 4 illustrates a functional block diagram of a contact center with an Intervention Manager according to one exemplary embodiment of the present invention.

Figure 5A illustrates inputs and outputs of an Intervention Manager according to one exemplary embodiment of the present invention.

Figure 5B illustrates functional relationships between primary inputs and primary outputs of an Intervention Manager according to one exemplary embodiment of the present invention.

Figure 5C illustrates functional relationships between primary inputs and primary outputs of an Intervention Manager according to one exemplary embodiment of the present invention in which the rate of intervention delivery is based on intervention parameters and contact center state.

Figures 6A and 6B graphically illustrate adjusting the number of performance interventions delivered over time based on the state of a contact center according to one exemplary embodiment of the present invention.

Figures 7A and 7B graphically illustrate predicting the state of a contact center and managing performance intervention delivery based on the prediction according to one exemplary embodiment of the present invention.

Figure 8 graphically illustrates adjusting the rate of delivering performance interventions based on the state of the contact center according to one exemplary embodiment of the present invention.

Figure 9 graphically illustrates selecting performance interventions based on performance intervention priority and contact center state according to one exemplary embodiment of the present invention.

Figure 10 illustrates a flow chart for an algorithm for managing performance intervention delivery according to one exemplary embodiment of the present invention.

Figure 11 illustrates a flow chart for an algorithm for adjusting the rate of delivering performance interventions according to one exemplary embodiment of the present invention.

Figure 12 illustrates a flow chart for an algorithm for selecting performance interventions according to one exemplary embodiment of the present invention.

Figure 13 illustrates a flow chart for an algorithm for selecting agents to receive performance interventions according to one exemplary embodiment of the present invention.

Figure 14 illustrates a flow chart for an algorithm for delivering performance interventions to agents according to one exemplary embodiment of the present invention.

Figure 15 illustrates a flow chart for an algorithm for controlling the delivery of performance interventions to agents according to one exemplary embodiment of the present invention.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

The present invention is directed to managing the delivery of performance interventions, such as training sessions, to agents in a contact center to enhance the operational effectiveness of the contact center. Delivering performance interventions increases the effectiveness, performance, and proficiency of the agent population. Managing the delivery of performance interventions to agents includes controlling the intervention delivery process to avoid adversely impacting the performance of the contact center during intervention delivery.

Description, Figures 1-3

Turning now to the drawings, in which like numerals indicate like elements throughout the several figures, an exemplary embodiment of the invention will now be described. Figures 1-3 are directed to the scheduled delivery of content, such as training, to a constituent contact agent, such as a call center agent. Although Figures 1-3 will be described with respect to the delivery of training materials to an agent in a call center, those skilled in the art will recognize that the invention may be utilized in connection with the scheduled delivery of a variety of information in other operating environments.

FIG. **1** illustrates a computer system for managing a call center in which one advantageous embodiment of the present invention is implemented. The illustrated call center **10** includes a training system **20** operative to schedule and deliver training materials to call center agents **40**. In a typical application of the call center **10**, a customer **30** calls via the public switched telephone network ("PSTN") or other network to the call center **10**. The customer call may be initiated in order to sign up for long distance service, inquire about a credit card bill, or purchase a catalog item, for example. Through the PSTN **34**, the call from the customer **30** reaches an Automatic Call Distribution ("ACD") component **32** of the call center. The ACD component functions to distribute calls from customers to each of a number of call center agents **40** who have been assigned to answer customer calls, take orders from customers, or perform other duties. Agents are typically equipped with a phone **42** and a call center computer terminal **44** for accessing product information, customer information, or other information through a database. For example, in a call center implemented to support a clothing catalog, the terminal **44** for an agent could display information regarding a specific item of clothing when a customer **30** expresses an interest in purchasing that item.

Customer phone calls and relevant database information are integrally managed by modern call centers **10** through what is known as computer/telephone integration ("CTI"). A CTI component **34** enables the call center **10** to extract information from the phone call itself and to integrate that information with database information. For example, the calling phone number of a customer **30** may be used in order to extract information regarding that customer stored in the call center database and to deliver that customer information to an agent **40** for the agent's use in interacting with the customer. CTI **34** may also interact with Intelligent Voice Response ("IVR") unit **36**, for example to provide a touchtone menu of options to a caller for directing the call to an appropriate agent.

Depending on the nature and function of the call center, a constituent contact engine **38** is a software-based engine within the call center **10**

that manages the interaction between customers and agents. For example, the constituent contact engine **38** may sequence the agent **40** through a series of information screens in response to the agent's information input during a customer call. The agent advantageously provides input to the constituent contact engine **38** through an agent user interface **46**, which is typically a graphical user interface presented at a computer terminal **44**.

A typical call center **10** includes a Workforce Management ("WFM") component **48**. WFM component **48** is used to manage the staffing of agents **40** in the call center **10** so that call center productivity can be optimized. For example, the volume of calls into or out of a call center **10** may vary significantly during the day, during the week, or during the month. WFM component **48** preferably receives historical call volume data from ACD component **32**. The WFM component **48** can determine an appropriate level of staffing of agents **40** so that call hold times are minimized, on the one hand, and so that agent overstaffing is avoided, on the other hand.

In a typical call center, customer calls and interactions between customers and agents **40** are selectively sampled as part of a quality control program within the call center **10**. This function is typically performed through a Quality Monitoring component **50** that monitors voice interaction through the agent's phone **42** and monitors information delivered through the system to the agent's terminal **44**. In addition, Customer Relationship Management ("CRM") systems **52** are often employed in call centers for a variety of marketing or customer service functions. For example, a CRM system **52** may be used to suggest to a caller ordering a certain book that the caller may wish to purchase other related books or other books that have been ordered by purchasers of the same book.

The call center **10** includes a communications network **54** to interconnect and link the aforementioned components. For a call center in which all elements are located at the same site, for instance, a local area network may provide the backbone for the call center communications network **54**. In call

centers for which the elements are geographically dispersed, the communications network may comprise a wide area network, a virtual private network, a satellite communications network, or other communications network elements as are known in the art.

The training system **20** according to one advantageous embodiment of the present invention is implemented in software and is installed in or associated with the call center computer system **10**. By integration with the WFM component **48** and/or the CTI **34** of the call center, the training system **20** can deliver training material to agents **40** via communications network **54** in scheduled batches. Integration with the WFM component **48** and the CTI **34** enables the training system **20** to deliver training materials to agents at times when those agents are available and when training will not adversely impact call center performance. The training system **20** is also preferably in communication with quality monitoring component **50** through the communications network **54** so that training materials may be delivered to those agents who are most in need of training. Proficient agents are thus spared the distraction of unneeded training, and training can be concentrated on those agents most in need. Advantageously, call center management may set pass/fail criteria within the quality monitoring component **50** to trigger the scheduling of appropriate training to appropriate agents. This functionality may be provided via a rules engine implemented as part of the training system **20** or within the contact engine of the call center. By integrating with the CTI **34**, the training system **20** can deliver training materials based on CTI-derived data such as customer call volume, independent of or complemented by the training schedule derived from the workforce management component **48** or the work distribution component **32.**

In another advantageous embodiment of the present invention, the training system **20** may be deployed on a stand-alone server located remotely from call center **10**. For example, training system could be deployed to serve a number of independent call centers **10**, such as in a "web services" business model. In such a remote deployment, the problems of integration with individual call center

computer systems can be avoided and the training system **20** can be maintained at a single central location.

A wide range of agent training scenarios can be supported by the training system **20**. The training materials that are appropriate for a particular call center application can vary according to the call center function. The subject matter of training materials may also vary widely; for example, training materials may be focused on product information, phone etiquette, problem resolution, or other subjects.

FIG. **2** is a block diagram illustrating a training system **20** for the scheduling and delivery of training materials to call center agents **40** in a call center **10**. The training system includes a number of interoperable software modules. Training authoring tool **100** is a software module that enables the managers of a call center to develop training materials, training courses, training quizzes, and other information to be delivered to agent **40** in the call center. Training system **20** preferably further includes a training management tool **102** that enables call center managers to assign agents to groups for training purposes, to assign training materials to individual groups, and to assign groups of courses to supersets of training groups.

The training system **20** preferably further includes an information delivery tool **104** that determines when the training materials assigned by the training management tool **102** are to be delivered to agents. The information delivery tool **104** preferably receives agent workload data and call center load data from ACD **32** through CTI **34**. The information delivery tool **104** also preferably receives agent schedule data from WFM **48**. The training system further comprises information access tool **106** for delivering the training materials to agents over communications network **54** on a scheduled basis so as not to disrupt agent customer contact duties. Agent consumption of training and training quiz performance are tracked by the reporting module **108**, which is preferably adapted to generate standard and custom reports to enable call center managers and supervisors to more effectively manage agent performance and training.

Turning now to FIGS. **1**, **2**, and **3A**, the steps in a method for delivering scheduled training to a contact agent within a call center operating environment are illustrated in flow chart form. The method begins at step **200**. At step **202**, the information delivery tool **104** within training system **20** accepts agent schedule data from WFM component **48** of the call center computer system **10**. The agent schedule data may be in many forms, but in one example the data includes agent assignments to the call center sorted by quarter-hour over a period of several days. At step **204**, the training system **20** analyzes the agent schedule data provided by the WFM component **48** to determine whether the agent is schedule for training. The method then proceeds to step **206**; if the agent is not scheduled for training, the "No" branch of the flow chart is followed and the method returns. If the agent is scheduled for training, then the "Yes" branch is followed to step **208**, where the agent's interaction with the agent user interface is monitored by information delivery tool **104** of the training system **20**. For example, mouse movements or keyboard activity at the agent user interface can be monitored to determine whether the agent is handling a customer call. The method then proceeds to step **210**, where the training system **20** determines, from the user interface activity, whether or not the agent is available for training. If the agent is not available for training, the method proceeds through the "No" branch to a wait loop at step **211** and the agent's interaction with the agent user interface is again monitored at step **208**. If the agent is available for training, the method proceeds through the "Yes" branch to step **212**, at which step the agent is prompted by the training system that training is available. This prompt may, for example, take the form of a pop-up screen delivered to the agent's terminal displaying a message indicating that training is now available for the agent.

The method then proceeds to step **214** at which step the training system **20** looks for an acknowledgment from the agent that the agent is ready for training. If the agent has not acknowledged by a certain predetermined time, for example, then the method proceeds through the "No" branch and returns. If the agent does acknowledge that the agent is ready for training, the method proceeds

through the "Yes" branch to step **218**, at which step training materials are delivered to the agent by information access tool **106** within the training system **20** over the communications network **54**. Preferably, the agent has logged off of the call center computer system contact engine **38** before the training materials are delivered. In this exemplary method, the training materials delivered can, for example, comprise a sequenced series of training segments each of limited duration that together form an integrated whole. Of course, the training materials can vary considerably from call center to call center as dictated by the function of the call center and the business supported by the call center **10**. The training materials delivery step **218** may be set to terminate after a predetermined amount of time. The method then terminates at step **220.**

Accordingly, the method according to one exemplary embodiment as illustrated in the flow diagram of FIG. **3**A accepts and analyzes agent schedule data provided from the WFM component of a call center computer system in order to non-disruptively schedule and deliver agent training.

According to another advantageous embodiment, the steps in a method for managing a call center or other constituent contact system are illustrated in the flow diagram of FIG. **3**B. According to this exemplary method, information from both the workforce management component **48** and the automatic call distribution component **32** are used by information delivery tool **104** within the training system **20** to non-disruptively schedule and deliver agent training. Referring now to FIGS. **1**, **2**, and **3**B, the method begins at step **240**. At step **242**, the information delivery tool **104** accepts agent schedule data from a workforce management component **48** of the call center computer system **10**. The method then proceeds to step **244**, where the agent schedule data is analyzed by the training system, and then proceeds to step **246**. If the training system **20** determines at step **246** that the agent is not scheduled for training, based on the analysis of the agent's schedule data, then the method proceeds through the "No" branch and returns. If the training system **20** determines at step **246** that the agent

is scheduled for training, then the method proceeds through the "Yes" branch to step **248**.

The information delivery tool **104** of the training system **20** accepts agent workload data at step **248** from the automatic call distribution component **32** or other work distribution component of the call center system. Moving to step **250**, the training system **20** analyzes the agent workload data to determine whether the call center's workload metrics (such as call volume or hold time) exceed certain predetermined thresholds. If the call center or the individual agent are too busy for the agent to be available for training, the method proceeds through the "No" branch at step **252** and returns. If the analysis of the call center metrics indicates that the agent is available for training, the method proceeds through the "Yes" branch to step **254**.

At step **254**, the training system **20** monitors the agent's interaction with the agent user interface, such as by monitoring mouse movements or terminal keystrokes. The training system **20** thereby determines whether or not the agent is available for training at step **256**. If unavailable, the method proceeds through the "No" branch to wait loop at step **258**, and the agent's interaction with the agent user interface is again monitored at step **254**. If the agent is available for training, the method proceeds through the "Yes" branch to step **260**.

At step **260**, the agent **40** is prompted by the training system **20** that training is available. The prompt to the agent may, for example, be in the form of a pop-up screen delivered to the agent's terminal **44** informing the agent that training is available. According to the method, the training system then waits for an acknowledgment by the agent that the agent is ready for training, as shown at step **262**. If the agent does not acknowledge that it is available for training, the method proceeds through the "No" branch and returns. If and when the agent acknowledges the prompt, the method proceeds through the "Yes" branch to step **264** and the agent is disconnected from the contact engine **38** within the call center computer system **10** so that interference between the training session and customer calls can be avoided. At step **266**, the information access tool **106** of

training system **20** delivers training materials to the agent **40** over the communications network **54**.

The information delivery tool **104** monitors the work distribution component **32** at step **267** and determines whether predetermined agent or call center workload thresholds are exceeded during training material delivery. If agent or call center thresholds are not exceeded, then training material delivery continues at step **266**. If thresholds are exceeded at step **267**, the agent is reconnected to call center contact engine **38** at step **268** to resume customer contact duties, and the method then terminates at step **270**.

The agent workload data provided by the ACD **32** or other work distribution component in the method illustrated in FIG. **3B** may take many forms. For example, the agent workload data may simply indicate that the level of call center activity within the system exceeds a certain predetermined threshold, and that no training for any agent is therefore appropriate at that time. As another example, the agent workload data may include individual workload data for each of several agents, indicating which, if any, agents are available for a training session. In any event, the agent workload data is preferably real-time or near real-time data reflecting the activity within the call center.

Workload thresholds for all agents as a group or for individual agents may be set advantageously by the manager of the call center depending on the needs of the particular call center. For example, if reports from the quality monitoring component **50** indicate that the quality of call center interactions with customers has declined over the past week, the thresholds may be adjusted so that training is provided even when the call center is relatively busy. Advantageously, these thresholds may also be set automatically as a function of data supplied by the quality monitoring component **50**.

FIG. **3C** illustrates the steps in a method according to another advantageous embodiment of the present invention. As shown in FIG. **3C**, a method is provided for managing a constituent contact system for a call center based on workload data from a work distribution component, such as an ACD.

Referring now to FIGS. **1**, **2**, **3C**, the method starts at step **280**. At step **282**, the information delivery tool **104** of the training system accepts agent workload data from the ACD **32** or other work distribution component. At step **284**, the training system **20** builds a workload data history from the agent workload data supplied by the ACD **32**. The workload data history may comprise, for example, data indicating the activity for all agents as a whole or for individual agents as a function of recent time. This data is advantageously used by the training system to forecast when and if all agents or some agents should be available for training at some point in the future. For example, if the workload data history indicates that call volume drops significantly between 10 p.m. and midnight on Fridays, then the training system can, by leveraging data from other systems, forecast that call volume will drop next Friday evening. The training system **20** can thereby determine if an agent should be available for training at some point in the future, such as next Friday evening, based on the workload data history.

If the training system **20** determines at step **286** that the agent should be available at an upcoming time, the method proceeds through the "Yes" branch to step **287**. If the system forecasts at step **286** that the agent will not be available at the upcoming time, the method proceeds through the "No" branch and returns. At step **287**, the training system monitors predetermined agent and call center workload thresholds. If those thresholds are not exceeded, the system proceeds to step **288.** If those workload thresholds are exceeded, the system returns to step **284** and updates the workload data history.

At step **288**, the training system **20** monitors the interaction of the agent **40** with the agent's user interface **46**, such as mouse movements or keystrokes. If the training system **20** determines at step **290** that the agent is not interacting with the agent's user interface **46**, then the method proceeds through the "Yes" branch to step **294**. If the agent is interacting with the agent's user interface, then the method proceeds through the "No" branch from step **290** to the wait loop at step **292** and again monitors agent user interface activity at step **288**.

At step **294**, the system prompts the agent that training is available. If the agent does not acknowledge the prompt at step **296**, the method returns. If the agent acknowledges the prompt at step **296**, the system disconnects the agent from the call center contact engine at step **298** and proceeds to step **300**.

At step **300**, training materials are delivered by the information access tool **106** to the agent **40** over the communications network **54**. Workload metrics for the agents in the call center and for the call center as a whole are monitored according to step **302**; if the workloads exceed predetermined thresholds, then the method proceeds through the "No" branch back to step **300** and the delivery of training materials continues. If, on the other hand, the workload levels through the training system increase beyond a predetermined threshold or a predetermined length for the training session is exceeded during the delivery of training materials to the agent, then the method proceeds through the "Yes" branch to step **304**, and the agent is reconnected to the call center contact engine so that the agent can return to handling customer call. The method ends at step **306**.

It should be emphasized that the illustration of a call center environment in the preceding discussion is an example of one common application that can take advantage of the present invention, but that the present invention is not limited to call centers or to the delivery of training materials. The methods provided by the present invention can be applied in any constituent contact environment and may include a variety of media through which contact with constituents may be made by the constituent contact system. For example, constituents may include, in addition to customers, the employees of an organization, sale representatives of an organization, suppliers of an organization, contractors of an organization, or other constituents.

Moreover, according to the present invention, the medium of communication between the system and the constituents may include voice contact over the public switched telephone network, e-mail communications provided through the Internet, Internet-based "chat" contact, video

communications provided over the Internet or over private broadband networks, or other communications media and forms as are known in the art.

In addition, the method provided by the present invention includes the delivery of a broad range of information to constituent contact agents. In addition to the training materials described above by way of example, any sort of information amenable to distribution via a digital communications network may be delivered in accordance with present invention. For example, new information, real-time video, sporting event information, music, conference call voice and video information, or other text, audio, video, graphics, or other information may be delivered without departing from the invention.

According to another aspect of the invention, a computer readable medium having computer executable instructions is provided that includes software components adapted to perform steps corresponding to the steps in the methods described above. According to one advantageous embodiment, a scheduling component, a monitoring component and a delivery component are provided. The scheduling component accepts agent schedule data from the training system or the other constituent contact system, including data regarding the assignment of an agent within the organization to perform communications duties via the system. The scheduling component also analyzes the agent schedule data to determine when the agent is scheduled to receive information and to schedule an information delivery session for the agent. The monitoring component monitors the agent's communications with constituents, such as through monitoring a user interface, in order to determine whether or not the agent is available to receive the information. The delivery component is adapted to deliver information to the agent over the communications network at times when the agent is scheduled to receive information as well as available to receive information.

In summary, the present invention can schedule and deliver training or other information to agents in a call center or other constituent contact system. Training materials or other information may be scheduled and delivered

to an agent without disrupting the agent's customer contact duties. Agent schedule data from a workforce management component or agent workload data from a work distribution component may be analyzed to decide whether or not an agent is scheduled for training or available for training. The user interface on the agent's terminal may be monitored by the training system **20** to determine whether the agent is busy interacting with constituents. If the agent is not busy, training materials or other information may be delivered to the agent's desktop through the system's communications network. To avoid interference between a training session and the agent's customer call duties, the agent may be disconnected from the system's customer contact engine before delivery of the training materials. If the call center's call volume or other metric exceeds a predetermined threshold during the training session, the session may be discontinued so that the agent may return to the agent's customer call duties.

Description, Figures 4-15

In addition to those embodiments discussed in connection with Figures 1-3, further embodiments of the present invention will be described in reference to Figures 4-15.

A performance intervention is a communication delivered, preferably via computer, to an agent with the intent to enhance the performance, proficiency, and/or effectiveness of that agent. A computer system can deliver the communication automatically or in response to manual input. The communication may be delivered exclusively via computer; alternatively, a computer and a human can collaborate to deliver the communication. For example, the computer can print out a recommended coaching script, and a human can follow the script in delivering coaching via traditional verbal communication. CBT sessions are one example of performance interventions. Reprimands, rewards, advice, coaching, one-on-one coaching, peer-to-peer coaching, supervisor-to-peer coaching, notices, warnings, feedback, reports, compliance statistics, performance statistics, and acknowledgements are other examples of performance interventions.

The term "state" or "contact center state" is used herein to refer to factors that describe or effect the contact center's overall operations. Contact center state includes measurements related to workload or activity level such as current call volume, historical call volume, and forecast call volume, each of which is sometimes described seasonally or over another increment of time. Contact center state also includes performance of the contact center. Time metrics of a contact center's performance include average handling time, hold time, average waiting time for each incoming call, and the fraction of calls connected to an agent within a specific length of time following call receipt. Additional metrics of contact center performance include agent performance indicators aggregated to the entire center and/or the center's agent population. Customer satisfaction index, abandonment, service level, compliance statistics, revenue goals and actuals, service level, new product roll out schedules, management directives, natural disasters, and catastrophic events are further examples of contact center state.

The term "abandonment rate" refers to the fraction of contacts who are engaged with the contact center but disconnect communication with the contact center prior to receiving service from an agent. The term "call volume" or "contact volume" refers to the number of calls or contacts that are engaged with the contact center in a unit of time, such as per day, per hour, per minute, or per second. The term "hold time" refers to the length of time between the contact center engaging a contact and an agent of the contact center initiating service with the contact. For example, hold time in an inbound call center is the time that the caller must wait on hold prior to being connected to an agent. The term "service level" refers to the percentage of incoming inquiries that are addressed in a target period of time, such as 80% of incoming calls answered within ten seconds.

The term "state level" or "state level setting" is used herein to refer to a specified contact center state. For example, management can define a state level specifying that at least 80% of calls should be answered within twenty seconds and that a lower percentage of calls answered is unacceptable. A state

level can also be a target or otherwise desired operational state. A "performance level" or a "performance level setting" is a state level setting for a performance-based state. "State range" is a range of states. Two examples of state ranges are the states that are above a specified state level and that states that are between an upper state level and a lower state level.

The term "contact center" is used herein to include centers, such as service centers, sales centers, and call centers that service inbound calls and/or outbound calls. A contact center can serve customers or constituents that are either internal or external to an organization, and the service can include audible communication, chat, and/or e-mail. A contact center can be physically located at one geographic site, such as a common building or complex. Alternatively, a contact center can be geographically dispersed and include multiple sites with agents working from home or in other telecommuting arrangements.

A typical computer-based contact center is an information rich environment. A network of data links facilitates information flow between the center's component systems. By tapping this network, the present invention can access historical, current, and forecast information from various center components and utilize this information in the process for managing performance intervention delivery. Consequently, the present invention can be responsive to new situations in the contact center environment, to fluctuations in contact center activity, and to other changes in the center's state.

Although an embodiment of the invention will be described with respect to managing the delivery of performance interventions at a contact center, those skilled in the art will recognize that the invention may be utilized in connection with the deployment of a variety of resources in other operating environments. One example other than a traditional call center environment is a technical support center within an organization that serves employees or members. Those skilled in the art will further recognize that the present invention may be utilized in connection with servicing inbound and outbound contacts at a contact center.

More generally, the business function provided by a contact center may be extended to other communications media and to contact with constituents of an organization other than customers. For example, an e-mail help desk may be employed by an organization to provide technical support to its employees. Web-based "chat"-type systems may be employed to provide information to sales prospects. When a broadband communications infrastructure is more widely deployed, systems for the delivery of broadband information, such as video information, to a broad range of constituents through constituent contact centers will likely be employed by many organizations.

Turning now to discuss each of the drawings presented in Figures 4-15, in which like numerals indicate like elements throughout the several figures, an exemplary embodiment of the invention will be described in detail.

Figure 4 illustrates a system for managing a contact center in which one advantageous embodiment of the present invention is implemented. A contact center **400** includes an arrangement of computer-based components coupled to one another through a set of data links **54** such as a network **54**. While some contact center functions are implemented in a single center component, other functions are dispersed among components. The information structure of the contact center **400** offers a distributed computing environment. In this environment, the code that supports software-based process steps does not necessarily execute in a singular component; rather, the code can execute in multiple components of the contact center **400**.

The communication network **54** of the contact center **400** facilitates information flow between the center's components. For a contact center **400** in which all elements are located at the same site, a local area network ("LAN") may provide the backbone for the contact center communication network **54**. In contact centers **400** with geographically dispersed components, the communications network **54** may comprise a wide area network ("WAN"), a virtual network, a satellite communications network, or other communications network elements as are known in the art.

In a typical application of the contact center **400**, a customer or other constituent calls the contact center **400** via the public switched telephone network (not illustrated in Figure 4) or other communication network. The customer may initiate the call in order to sign up for long distance service, inquire about a credit card bill, or purchase a catalog item, for example.

An automatic call/work distribution ("ACD") component **32** receives incoming calls from the telephone network, holds calls in queues, and distributes these calls within the contact center **400**. ACD software generally executes in a switching system, such as a private branch exchange. The private branch exchange connects customer calls to terminals **44** operated by contact center agents **40** who have been assigned to serve one or more specific queues, for example to answer customer complaints, take orders from customers, or perform other interaction duties. In alternative embodiments of the invention, the function of the ACD **32** can be replaced by other communications routers. For example, in a contact system **400** using email, an email server and router can distribute electronic messages.

The ACD **32** maintains one or more queues for holding each incoming call that is waiting to be routed to an agent **40**, who will service the call. Upon receipt of an incoming call from a customer or other constituent, the ACD **32** categorizes the call and identifies, on the basis of the categorization, a specific queue to hold the call. The ACD **32** then places the call in the specific queue and selects one agent **40** to service the call from a group of agents assigned to service the specific queue. By activating a physical switch, the ACD **32** then routes the call to the select agent **40**.

The ACD **32** uses a rules-based distribution engine **425** to categorize each incoming call by applying categorization rules to information that is known about the call. Based on the categorization, the ACD **32** matches the call with one of several queues. In other words, each queue holds a specific category of call. For example, one queue might hold calls from Spanish-speaking callers seeking to order flowers while another queue might hold calls from

English-speaking callers seeking to order candy. The rules based distribution engine **425** includes software algorithms that select a specific agent **40** to receive the incoming call. The software algorithms match the call to an agent **40** who is available and has appropriate qualifications and performance history.

When the ACD **32** routes the call to an available agent **40**, the agent **40** receives the call and communicates with the caller over a telephone **42** while entering and receiving information through a computer terminal **44**. The terminal **44** provides the agent **40** with access to product information, customer information, or other information through databases. For example, in a contact center **400** implemented to support a catalog-based clothing merchant, the computer terminal **44** for an agent **40** could display information regarding a specific item of clothing when a customer expresses an interest in purchasing that item. Agents **40** can also view information about the call that the ACD **32** derived from the call when the call first came into the contact center **400**. A desktop application, which is usually a customer resource management component (not shown in Figure 4), facilitates an agent's interaction with a caller.

In addition to routing calls, the ACD **32** monitors and records call volume and call processing statistics, which are forms of contact center state **432**. Thus, the ACD **32** is one type of monitor in the contact center **400** that provides contact center state **432**. The ACD **32** provides current and historical measurements **432** of the number of calls that the contact center **400** receives for an increment of time, such as the number of calls received per second, per day, or per shift. The ACD **32** records the length of time **432** that each call waits in a queue before being serviced by an agent **40** and the length of each call. Upon query, the ACD **32** provides aggregate wait time statistics **432** for a specified period of time. The ACD also tracks after-call work, such as notes that an agent enters into the system after concluding service with a contact.

To support routing calls to agents **40** who are available to receive calls, the ACD **32** maintains an activity code for each agent **40**. Each agent's activity code describes that agent's current activity. For example, an activity code

may report that an agent **40** is servicing a call, idle and waiting to be connected to an incoming call, receiving a performance intervention, taking a break, or in after-call work.

In addition to describing the availability to receive an incoming call, the ACD's activity codes support determining each agent's availability to undertake specific activities. Thus, the ACD **32** maintains data **435** that describes each agent's availability to receive performance interventions. This data **435** is available via the contact center's network **54** to various systems in the center **400**, including a workforce management ("WFM") component **48**.

The WFM component **48** manages the staffing level of agents **40** in the contact center **400** to support improving the contact center's productivity and profit. For example, the volume of calls into or out of a contact center **400** may vary significantly during the day, during the week, or during the month. The WFM component **48** can receive historical call volume data from the ACD **32** and use this information to create work schedules **440** for agents **40**. WFM components **48** commonly employ the Erlanger Algorithm, which is known to those skilled in the art, to forecast scheduling resources. Historical call volume data **432** can be the basis for forecasting future call volume **432** and/or other forecasts of the contact center's state **432**. The WFM component **48** can generate current and forecasted state **432** based on data from the ACD **32** and from its internal information regarding agent staffing.

In one embodiment of the present invention, the WFM component **48** receives current and historical call volume data **432** from the ACD **32**. The WFM component **48** fits current and recent call volume data **432** to historical data patterns and projects this data **432** into the future to derive a forecasted call volume **432**. In one embodiment of the present invention, this projection is based on a simple linear curve fit. The WFM component **48** overlays forecasted call volume **432** onto an agent work schedule **440** to provide a forecast of contact center performance **432**.

The WFM component **48** also communicates time and attendance data **441** to the contact center's human resources and payroll system **442**. This communication facilitates computing an agent's compensation based on that agent's activities. Agents **40** may receive bonuses upon complying with a goal, such as servicing calls for more than a specified percentage of the time in a shift. To avoid penalizing an agent **40** for time spent receiving a performance intervention, the WFM component **48** sends a record **441** of such time to the center's human resources and payroll systems **442**. The human resources and payroll systems use this information **441** to compute the agent's compensation. In other words, the WFM component **48** communicates information **441** to the human resources and payroll system **442** to facilitate rewarding an agent **40** for productive activities and to avoid penalizing an agent **40** for mandated activities.

Also, an agent **40** in a contact center **400** may receive a bonus or variable pay based on how well the agent **40** adheres to a schedule. To avoid considering an agent **40** out of compliance during the delivery of a performance intervention, the WFM component **48** is notified of the intervention delivery.

As yet another example of coordinating and tracking activities in the contact center **400**, the intervention delivery system **430** periodically synchronizes with the WFM component **48** and the ACD **32**. The synchronization process includes synchronizing for time spent in training and compliance with training schedules. In one embodiment of the present invention, the Intervention Manager **460** executes this synchronization process.

An agent performance evaluator **410** provides measurements and indications of agent performance that are useful to management and to the various components of the contact center **400**. The agent performance evaluator **410** stores these measurements and indications in the agent profiles database **449** and regularly updates them. That is, an agent profile, which is stored in the agent profiles database **449** can include one or more indications of an agent's performance. Various components of the contact center **400** can access this data though the contact center's network infrastructure **54**.

In addition to agent performance data, an agent profile can include other agent parameters that describe an agent's capability to contribute to the contact center **40**. For example, it can include a characterization of an agent's skills and competencies. Also, it can include an agent's traits, such as personality and cognitive traits.

The agent performance evaluator **410** typically determines the level of agent skill and competency in each of several areas by accessing information from the center components that collect and track agent performance information. Examples of these components include, but are not limited to, the intervention delivery system **430**, the WFM component **48**, the ACD **32**, and a quality monitoring system (not illustrated in Figure 4). The relevant skills and competencies for a contact center **400** serving a catalog clothing merchant could include product configuration knowledge (e.g. color options), knowledge of shipping and payment options, knowledge of competitor differentiation, finesse of handling irate customers, and multilingual fluency.

In one embodiment of the present invention, the agent performance evaluator **410** includes an agent performance ranking function that assigns a performance rank, or index, to each agent **40**. The agent performance evaluator **410** stores each agent's rank in the agent profiles database **449** and provides a list of agents **40** ordered by performance rank to the Intervention Manager **460**.

The agent performance evaluator **410** also stores raw monitoring data describing agent performance in the agent profiles database **449**. This database **449** is typically maintained in a bulk storage drive or the hard drive of a LAN server, where the data is readily accessible to the Intervention Manager **460** as well as other devices in the contact center **400**. Agent performance data includes raw performance statistics as well as aggregated statistics and derived metrics. The agent performance evaluator **410** also generates agent performance data based on performance-related information from various components in the contact center **400**. For example, the agent performance evaluator can compute metrics of agent performance, which are characterizations of an agent's job

performance, utilizing handling time statistics that are tracked by the ACD **32**. Such statistics can be tracked by one or more of the other systems in the contact center **400**, such as a customer resource management component (illustrated in Figure 1 but not in Figure 4). In one embodiment of the present invention, the agent performance evaluator **410** determines performance indicators such as: close ratio, first call resolution, quality, complaint ratio, cross-sales rate, revenue per call, and average handling time for each agent **40**.

In one embodiment of the present invention, the agent performance evaluator **410** is a system that is physically dispersed in the contact center **400**. In this configuration, the agent performance evaluator **410** can include the system components in the contact center that contain agent performance information such as average handling time, close ratio, quality, etc. The intervention delivery system **430** uses performance monitoring data to ascertain performance gaps that exist for one or more agents **40** so that appropriate performance interventions can be assigned to address those gaps. Analyzing one or any combination of performance metrics can determine the need for performance interventions. For example, if an agent's revenue per call is below average, then the intervention delivery system **430** could elect to deliver sales tips.

The agent profiles database **449** includes agent performance indicators for each agent **40**. Performance indicators for an agent **40** are metrics of that individual agent's actual on-the-job performance. Performance indicators include quality, call handling time, first call resolution, cross-sell statistics, quality, close ratio, revenue per hour, revenue per call, calls per hour, and speed of answer, for example. Agent performance reflects an aspect of an agent's demonstrated service of a real contact.

The agent profiles database **449** also includes agent qualifications data for each agent **40**. Agent qualifications are distinct from agent performance. Agent qualifications reflect characteristics of an agent **40**. Although agent qualifications are sometimes correlated to on-the-job performance, agent qualifications are not necessarily correlated to performance. For example, an

agent who is highly trained on the technical aspects of diamonds may be an inept diamond seller as measured by actual, on-the-job performance. Agent qualifications include an agent's innate traits such as cognitive skills and personality. Agent qualifications also include an agent's skills and competencies. Foreign language fluencies, product expertise acquired by receiving performance interventions involving specific products, and listening skills are examples of an agent's skill and competency qualifications.

The intervention delivery system **430** and the agent performance evaluator **410** update the agent profile database **449** when new information is available from the various computer-based components in the contact center **400**. In one embodiment of the present invention, the agent profiles database **449** preferentially includes real-time data regarding agent qualifications and performance indicators such as agent parameters data **450**.

The term "agent parameters" as used herein refers to any characteristic of an agent **40** that is pertinent to performance intervention delivery. Agent performance, agent qualifications, work schedules, successful completion of performance interventions, time since last intervention, and performance intervention assignment are examples of agent parameters.

An agent's ability to impact the operational effectiveness of the contact center **400** is another example of an agent parameter. Agent parameters can also include an estimate or other indication of the benefit that the contact center **400** is likely to derive from delivering a performance intervention to a specific agent **40**. In other words, delivering a performance intervention to an agent **40** should benefit the contact center by improving the contact center's long-term operational effectiveness. An agent parameter can be a relative or absolute characterization of such improvement or benefit.

An agent **40** who is a poor performer may realize significant performance improvement from one or more performance interventions. This may be especially true for new-hire agents who have high cognitive abilities and desire to excel. In contrast, a senior agent **40** who is a strong performer may gain

only modest benefit from a performance intervention, especially if the performance intervention is not geared towards advanced instruction. Thus, selecting poor performers to preferentially receive performance interventions can benefit the contact center **400** as a whole. Nevertheless, certain poor performers may achieve little or no performance gain from an extensive regime of performance interventions. In other words, the agent population **40** may include agents **40** with a low propensity to improve with training or other performance interventions. An agent parameter that describes benefit to the contact center **400** derived from delivering a performance intervention to a specific agent **40** can reflect agent trainability as well as other considerations.

"Intervention assignment" or "performance intervention assignment" refers to the interventions that are assigned to be delivered to one or more agents **40**.

The intervention delivery system **430** accepts performance monitoring input from the agent performance evaluator **410** via the agent profiles database **449** as feedback for agent performance intervention programs, such as training programs. In one embodiment of the present invention, the intervention delivery system **430** is a training system that delivers instructive content to agents **40**. In one embodiment of the present invention, the intervention delivery system **430** is a CBT system that is implemented in software and coupled to the contact center's communications network **54**. Under the control of the Intervention Manager **460**, the intervention delivery system **430** delivers intervention content in a manner that promotes both the short- and long-term performance of the contact center **400**. Furthermore, the intervention delivery system **430** delivers content to agents **40** at times when those agents are available and when the performance intervention will not adversely impact the contact center's operations.

The intervention delivery system **430** is also in communication with the agent performance evaluator **410** through the Intervention Manager **460** so that appropriate intervention content, such as training materials, may be

delivered to the agents **40** who are most in need of receiving a performance intervention. Proficient agents **40** are thus spared the distraction of unneeded performance interventions, and interventions can be concentrated on those agents **40** most in need and on areas of greatest need for those agents **40**. Contact center management may establish pass/fail or remediation thresholds to enable the assignment of appropriate performance interventions to appropriate agents **40**. This functionality is provided within the Intervention Manager **460**. Preferably, agent skills that are found to be deficient relative to the thresholds are flagged and stored in a storage device within the agent profiles **42**.

The intervention delivery system **430** can assess various aspects of an agent's qualifications. By administering a traits test, the intervention delivery system **430** characterizes an agent's personality and cognitive abilities. A traits test is typically only administered once for each agent **40**, since for most agents **40**, cognitive ability and personality do not change dramatically during employment. By administering a skills and competencies test, the intervention delivery system **40** can identify knowledge gaps and determine agent qualifications that improve with training and on-the-job experience.

With an understanding of agent's skills and competencies, performance interventions can be administered to improve skills and competencies. Once the performance intervention is administered, an assessment can be provided to ensure the agent **40** understood and retained the content. In addition, the agent's performance can be monitored to determine if performance has changed based upon the acquisition of the new information. When the agent's performance has changed, the intervention delivery system **430** can automatically update the agent's skills and competencies in the agent profiles database **449**, thereby maintaining an up-to-date view of agent qualifications. Similarly, the intervention delivery system **430** maintains an intervention profiles database **469** that holds intervention parameters **470** and other descriptive information regarding each performance intervention in the contact center's portfolio of performance interventions.

The term "intervention parameter" as used herein refers to any attribute of an intervention that is pertinent to intervention delivery. Examples of intervention parameters include length of intervention, priority of intervention, and requirement to deliver the intervention by a deadline.

In tandem with the agent performance evaluator **410**, the intervention delivery system **430** can determine if an agent **40** effectively practices the subject matter of a completed performance intervention, such as a training session. Immediately following a computer-administered test, the results are available throughout the contact center's information network infrastructure **54**.

Coupled to the information infrastructure **54** of the contact center **400**, the Intervention Manager **460** accesses information from components and computer systems throughout the center **400** to ascertain the dynamic operating conditions of the center **400**. Thus, the Intervention Manager **460** receives contact center state **432**, agent parameter information, and intervention parameters **470** via the contact center network **54**. The Intervention Manager **460** processes this information according to management input **480** using software algorithms to determine parameters for managing the delivery of performance interventions to contact center agents **40**.

The Intervention Manager **460** computes the rate of delivering performance interventions to agents **40** based on these inputs, **432**, **449**, and **470**, and management input **480**. The number of performance interventions delivered for an increment of time is a function of contact center state **432**. The intervention delivery system **430** implements the delivery of performance interventions according to the rate set by the Intervention Manager **460**.

If contact center state **432** indicates that contact center operations are below a desired level **480**, such as a management input performance target **480**, the Intervention Manager **460** decreases the rate of performance intervention delivery. Decreasing the rate of performance intervention delivery increases the number of agents **40** who are available to service contacts, thereby improving operational effectiveness and efficiencies.

If contact center state **432** indicates that the performance of the contact center **400** is higher than required, the Intervention Manager **460** increases the rate of performance intervention delivery, thereby diverting agents **40** from servicing contacts and engaging them to receive performance interventions. In this manner, the contact center **400** enhances the capabilities of its agents **40** without compromising the center's short-term performance.

In addition to setting the rate of performance intervention delivery, the Intervention Manager **460** selects the performance interventions that the performance intervention delivery system **430** delivers to agents **40**. To make the selection, the Intervention Manager **460** compares state **432** of the contact center **400** to intervention parameters **470** and management input **480**. Using contact center state **432** as a factor in selecting interventions provides responsiveness to dynamic conditions in the contact center **400**.

The Intervention Manager **460** computes the selection of performance interventions based on intervention priority, which is an intervention parameter **470**, one or more state levels **480**, which are management inputs **480**, and contact center state **432**, such as operational performance. The Intervention Manager **460** can also select interventions based on other intervention parameters **470**, such as intervention length or intervention cost. Furthermore, the Intervention Manager **460** can select performance interventions that best serve the operational effectiveness of the contact center **400**. For example, the Intervention Manager **460** can select one performance intervention over another intervention based on an estimate that the selected performance intervention will yield more benefit to the contact center **400**.

At any time, the contact center **400** typically maintains a list of performance interventions for which delivery is desirable. The performance interventions in the list have a range of priorities, or importance of delivery. In other words, delivery is critical for certain performance interventions and less important for others.

Intervention priority is typically set by management to define the relative importance or time-sensitive aspects of certain performance interventions relative to other others. For example, in advance of a seasonal sales flurry, such as selling flowers for Valentines Day, management may elect to define a flower-selling instructional session as a critical-priority performance intervention.

If performance **432** of the contact center **400** is lower than desirable, the Intervention Manager **460** can elect to deliver only performance interventions having critical delivery requirements. Consequently, when the contact center **400** is not operating as smoothly as desired, the Intervention Manager **460** avoids unnecessarily diverting an agent **40** from servicing contacts to receiving performance interventions. This function promotes the short-term performance of the contact center **400**. When the contact center **400** is operating better than required, the Intervention Manager **460** is more liberal in its selection of performance interventions.

The contact center performance levels **480** that are thresholds for selecting performance interventions based on priority are management inputs **480**. Personnel in the contact center **400** typically set these levels **480** according to managerial objectives; however, a computer algorithm can also define and/or adjust the state level settings **480**. In other words, either a human or a machine in the contact center **400** can provide management input **480** to the Intervention Manager **460**.

In addition to selecting performance interventions and pacing intervention delivery, the Intervention Manager **460** selects agents to receive performance interventions based on agent need. The Intervention Manager **460** can elect to deliver performance interventions on a priority basis to low-performing agents **40**. Concentrating performance interventions on low-performance agents **40** typically increases the aggregate performance of the agent population **40** more than evenly distributing performance interventions amongst the agent population **40**. That is, the Intervention Manager selects agents **40** to

receive performance interventions to serve the operational goals of the contact center **400** as a whole.

In one embodiment of the present invention, the Intervention Manager's agent selection includes a sequence of agents **40** to receive performance interventions. For example, the sequence follows the ranked order of agent performance, starting with the lowest performing agent **40** and progressively sequencing towards the best performer. The intervention delivery system **430** receives the sequence from the Intervention Manager **460** and delivers performance interventions accordingly.

Those skilled in the information-technology, computing, or contact center arts will recognize that the components, data, and functions that are illustrated as individual blocks in Figure 4 and discussed above are not necessarily well defined modules. Furthermore, the contents of each block are not necessarily positioned in one physical location of the contact center **400**. In one embodiment of the present invention, the blocks represent virtual modules, and the components, data, and functions are physically dispersed. For example, in one embodiment of the present invention, the contact center state **432**, the agent parameters **450**, the agent availability data **435**, the agent schedules **440**, and the intervention parameters **470** are all stored on a single computer readable medium that can be offsite of the contact center **400** and accessed via a WAN.

In one embodiment of the present invention all of the computations and algorithms related to managing performance intervention delivery are stored on a single computer readable medium and executed by a single microprocessor. In yet another embodiment, multiple contact center components each execute one or more steps in the intervention management process. In general, the present invention can include processes and elements that are either dispersed or centralized according to techniques known in the computing and information-technology arts.

The present invention includes multiple computer programs which embody the functions described herein and illustrated in the exemplary flow

charts and graphs and diagrams of Figures 5-15. However, it should be apparent that there could be many different ways of implementing the invention in computer programming, and the invention should not be construed as limited to any one set of computer program instructions. Further, a skilled programmer would be able to write such a computer program to implement the disclosed invention without difficulty based on the exemplary data tables and flow charts and associated description in the application text, for example.

Therefore, disclosure of a particular set of program code instructions is not considered necessary for an adequate understanding of how to make and use the invention. The inventive functionality of the claimed computer program will be explained in more detail in the following description in conjunction with the remaining figures illustrating the functions and program flow.

Certain steps in the processes described below must naturally precede others for the present invention to function as described. However, the present invention is not limited to the order of the steps described if such order or sequence does not alter the functionality of the present invention. That is, it is recognized that some steps may be performed before or after other steps or in parallel with other steps without departing from the scope and spirit of the present invention.

Figure 5A illustrates primary inputs and primary outputs of an Intervention Manager **460** according to one exemplary embodiment of the present invention. Contact center state **432**, intervention parameters **470**, and agent parameters **450** are primary inputs to the Intervention Manager **460**. The Intervention Manager **460** processes these three primary inputs, **432**, **450**, and **470**, to provide three primary output parameters, **510**, **520**, and **530**, to the intervention delivery system **430**, which responds accordingly. In other words, the Intervention Manager **460** controls performance intervention delivery by outputting controlling inputs **510**, **520**, **530** to the intervention delivery system **430**. The primary inputs, **432**, **470**, and **450**, and the primary outputs, **510**, **520**,

and **530,** of the Intervention Manager **460** can each be a single value or an array of values, such as a vector or a matrix of numbers.

Contact center state **432**, the first of the three primary inputs **432**, **470**, **150** to the Intervention Manager **460**, is a measurement of operational performance in the contact center **400**, according to one embodiment of the present invention. Exemplary performance metrics include average wait time and percentage of calls connected to an agent **40** within a preset period of time, such as twenty seconds. In another embodiment of the present invention, contact center state **432** is a measurement of load, or call volume.

Intervention parameters **470**, the second of the three primary inputs to the Intervention Manager **460**, are attributes of each performance intervention that are pertinent to intervention delivery. In one embodiment of the present invention, the priority of each performance intervention is the intervention parameter **470** that the Intervention Manager **460** uses for its output computations. That is, a performance intervention's priority designates the importance of delivering that intervention, and the Intervention Manager **460** manages intervention delivery based on that priority designation.

Priority categories, such as critical, high, medium, and low categories, designate performance interventions with similar delivery importance. Alternatively, the contact center's management prioritizes performance interventions by ranking each performance intervention according to the relative importance of its delivery. An index value can represent this ranking. In one embodiment of the present invention, a continuous scale specifies the priority of each performance intervention.

In addition to priority, intervention parameters **470** can include performance interventions assignments, intervention content, and intervention length. For example, management may assign performance interventions to specific agents **40**. Intervention content can include the subject matter of a training session, such as instructing agents **40** to sell roses to contacts who are placing incoming calls to the contact center **400** during the Valentines season.

Agent parameters **450**, the third of three primary inputs **432**, **470**, **450** to the Intervention Manager **460**, includes the aspects of each agent **40** that are pertinent to performance intervention delivery. Agent parameters **450** include agent performance. In one embodiment of the present invention, agent performance includes each agent's ranked performance. That is each agent **40** is assigned a number that ranks his/her ordered performance, spanning from best to worst. Agent parameters **450** also include a list of the performance interventions that each agent **40** has previously received. In one embodiment of the present invention, agent parameters can also include each agent's work schedule **440**, which is available from the WFM component **48**. Agent parameters **450** can also include skills and competencies and traits.

Rate of performance intervention delivery **510**, the first of the three primary outputs from the Intervention Manager **460**, is the number of performance interventions delivered over an arbitrary increment of time, such as per second, minute, hour, day, or shift. This primary output **510** sets the frequency with which the intervention delivery system **430** delivers performance interventions. The rate of performance intervention delivery **510** measures the number of performance interventions for which delivery is initiated. Alternatively, the rate of performance intervention delivery **510** measures the number of performance interventions completed.

Intervention selection **520**, the second of the three primary outputs from the Intervention Manager **460**, is the determination of which performance interventions are delivered by the intervention delivery system **430** to at least one agent **40**. In one embodiment of the present invention, performance intervention selection **520** is a subset of performance interventions assigned for delivery by management of the contact center **400**. In one embodiment of the present invention, intervention selection **520** specifies a group of performance interventions, such as a prioritization category. That is, intervention selection **520** can instruct the intervention delivery system **430** to select a critical, a high, a medium, or a low priority performance intervention for delivery. Furthermore, an

intervention selection **520** can specify that the intervention delivery system **430** is to deliver multiple performance interventions that have a defined combination of priorities.

Agent selection **530**, the third of the three primary outputs from the Intervention Manager **460**, is the determination of the agents **40** to whom the intervention delivery system **430** delivers performance interventions. In one embodiment of the present invention, agent selection **530** is an ordered sequence of agents **40**. Agent selection can also be based on a worst-to-best ordered ranking of agents, the time lapse since each agent received a performance intervention, or the ages of performance intervention assignments. For example, an agent **40** who was assigned a performance intervention several weeks earlier can receive his/her performance intervention rather than another agent **40** who received the performance intervention a few hours earlier.

The Intervention Manager **460** also includes provisions to accept management inputs **480**. Management inputs **480** are settings that adjust the Intervention Manager's computations and algorithms. That is, management input **480** is a vehicle to modify or define the functional relationships between the primary inputs **432**, **470**, **450** and the primary outputs **510**, **520**, **530** of the Intervention Manager **460**. In one embodiment of the present invention, the contact center's personnel enter the management inputs **480** through a computer terminal. In another embodiment of the present invention, one or more of the contact center's computer-based systems automatically compute and provide the management input **480** to the Intervention Manager **460**.

In one embodiment of the present invention, management input **480** is a contact center state level **480**. The Intervention Manager **460** compares the primary input contact center state **432** to the contact center state level **480** and adjusts at least one of the primary outputs **510, 520, 530** on the basis of the comparison.

Figure 5B illustrates functional relationships between the three primary inputs **432**, **470**, **450** and the three primary outputs **510**, **520**, **530** of the

Intervention Manager **460** according to one embodiment of the present invention. Function F1 **550**, Function F2 **560**, and Function F3 **570** describe the algorithms through which the Intervention Manager **460** computes intervention delivery parameters **510**, **520**, **530**, which are output to the intervention delivery system **430**.

As illustrated in Figure 5B, the Intervention Manager **460** computes the rate of performance intervention delivery **510** on the basis of contact center state **432** using Function F1 **550**. That is, contact center state **432** is the primary input variable that algorithm F1 **550** uses to compute the rate of performance intervention delivery **510**. Management input **480** is another input to the F1 algorithm **550**. Contact center personnel can enter a contact center state level **480** into the Intervention Manager **460** as management input **480**. Algorithm F1 **550** increases the rate **510** of performance intervention delivery **510** when measured contact center state **432** falls below the state level **480** and decreases the rate **510** when measured state **432** rises above the state level **480**.

Function F2 **560** computes the selection **520** of performance interventions based on contact center state **432** and intervention parameters **470**. According to an exemplary embodiment of the present invention, this function **560** is an algorithm **560** that compares the state **432** of the contact center **400** to one or more state levels **480**, which are management inputs **480**. The algorithm **560** applies rules to the results of the comparison to determine the characteristics of the performance interventions that are to be delivered to agents **40**. To select specific performance interventions with these characteristics, the Intervention Manager **460** searches the performance interventions that are eligible for delivery and identifies one or more matches. A performance intervention is typically eligible for delivery if it is assigned to at least one agent **40**.

In an exemplary embodiment, the Function F2 algorithm **560** includes rules that determine a suitable priority **520** of intervention that should be delivered based on the state **432** of the contact center **400**. For example, if the contact center's performance **432** is within a certain performance band **480**, the

rules restrict intervention delivery to interventions having a specified priority category that corresponds to the band. Applying the specified priority **520** to the intervention parameters **470** of eligible performance interventions, the algorithm **560** identifies a performance intervention having a suitable priority. The intervention delivery system **430** then delivers the identified performance intervention to one or more agents **40**.

Function F3 **570** computes the selection **530** of agents **40** who are to receive performance interventions. In one embodiment of the present invention, the Intervention Manager **460** coordinates selecting agents **40** with determining intervention delivery rate **510**. In another embodiment of the present invention, the Intervention Manager **460** coordinates selecting agents **40** with selecting performance interventions. In yet another embodiment of the present invention, the Intervention Manager **460** coordinates selecting agents both with selecting performance interventions and with determining intervention delivery rate **510**. In other words, the Intervention Manager **460** can coordinate Function F3 **370** with Function F2 **560**, with Function F1 **550**, or with Function F2 **560** and Function F1 **550**.

To select agents **530** to receive performance interventions, Function F3 **570** accesses agent parameters **450** to determine which agents **40** have the greatest need for performance interventions. In one embodiment of the present invention, the Intervention Manager **460** correlates agent need for performance intervention to agent performance. The Intervention Manager **460** ascertains agent performance from the agent performance evaluator or from agent profiles database **449**.

Figure 5C illustrates the input-to-output functional relationships of the Intervention Manager **460**, according to another embodiment of the present invention. In this embodiment, the rate of intervention delivery **510** is a function not only of the contact center state **432**, but also of intervention parameters **470**, such as intervention priority. In this embodiment, the Intervention Manager **460** can elect to accelerate the delivery of performance interventions when

intervention parameters **470** warrant such accelerated delivery. For example, the contact center **400** may face a deadline to deliver one or more performance interventions that are time sensitive or otherwise critically important. The Intervention Manager **460** can respond to meet the deadline by increasing the number of performance interventions delivered during a time period preceding the deadline.

Figure 6 illustrates the Intervention Manager **460** adjusting the rate of delivering performance interventions according to one exemplary embodiment of the present invention. The upper graph **610** presents monitored contact center state **432** and a management-input state level setting **480** over time. In this embodiment, contact center state **432** is contact center performance **432**. In other words, the graph **610** illustrates the measured operational performance **432** of a contact center **40** as compared to a certain level **480**. Without defining a specific metric of contact center performance **432**, this graph **610** illustrates representative fluctuations of any of the contact center performance variables described herein. Furthermore, the upper graph **610** also illustrates contact center performance **432** responding to intervention delivery by the intervention delivery system **430** under management by the Intervention Manager **460**.

The lower graph **620** illustrates the rate of intervention delivery **510** as set by the Intervention Manager **460** in response to the conditions illustrated in the upper graph **610**. In other words, the lower graph **620** depicts the Intervention Manager **460** adjusting the rate of intervention delivery based on the monitored performance **432** of the contact center **400**.

Together, the two graphs **610**, **620** illustrate the interaction between the Intervention Manager **460** and the operating conditions **432** of the contact center **400**, wherein operating conditions **432** are characterized by contact center state **432**. That is, the graphs **610**, **620** illustrate an exemplary sequence of actions and reactions between the Intervention Manager **460** and the operations of the contact center **400**.

In one embodiment of the present invention, the Intervention Manager **460** controls the performance **432** of the contact center **400** with closed loop control using monitored performance **432** as feedback for adjusting the rate **510** of intervention delivery. That is, in one embodiment, the present invention monitors the current performance **432** of the contact center **400** and dynamically manipulates the number **510** of performance interventions delivered in an increment of time so as to control performance **432** to a desired level **480**.

At the time period **630** between t_1 and t_2, contact center performance **432** is significantly above a performance level setting **480**, which is a management input **480**. These conditions suit the delivery of performance interventions, since at least some agents **40** can be diverted from servicing contacts while maintaining acceptable contact center performance **432**. At time t_2, the Intervention Manager **460** elects to initiate delivering performance interventions. Manual intervention by contact center personnel, such as by an administrator or a manager, can prompt this initiation. Alternatively, either the Intervention Manager **460** or another computer-based system in the contact center **400** can trigger the delivery of performance interventions at time t_2.

At time t_2, the Intervention Manager **460** begins ramping the rate **550** of delivering performance interventions. That is, in the time period **640** between time t_2 and time t_3, the Intervention Manager **460** progressively increases the number **510** of interventions delivered per increment of time from zero upward. As agents **40** suspend servicing contacts and begin receiving performance interventions, monitored contact center performance **432** declines and ultimately falls below the management input state level setting **480**.

At time t_3, the Intervention Manager **460** determines that contact center state **432** has fallen unacceptably below the state level setting **480** and ceases delivering performance interventions. In one embodiment of the present invention, ceasing delivering performance interventions entails terminating performance interventions that are in progress. Such termination can follow a specific agent sequence. The agent termination sequence can proceed according

to management input, last-in-first-out, first-in-last-out, worst-agent-to-best-agent, time since last performance intervention, or other formula. In an alternative embodiment, ceasing initiating new performance interventions curtails the rate **550** of intervention delivery, for example smoothly decreasing the rate of delivering performance interventions until contact center state **432** recovers to an acceptable level **480**.

At time t_3, the rate **510** of performance delivery is higher that the current conditions of the contact center **400** can support while maintaining an acceptable level **480** of operational performance. One or multiple factors can contribute to such unacceptable operational performance at time t_3. For example, an unexpected spike in call volume during the time frame **640** might cause hold time to increase unacceptably. A random increase in the length of time required to service contacts during the time frame **640** might cause wait time to increase, even with constant call volume. Even with constant contact center conditions during the time frame **640**, the Intervention Manager **640** increasing the deliver rate **510** too aggressively might cause unacceptable performance.

Regardless of the cause of the unacceptable performance, the graphs **610**, **620** illustrate the Intervention Manager **640** adapting to unacceptable performance and implementing corrective action by changing the rate **510** of delivering performance interventions to zero at time t_3.

During the time period **650** between time t3 and time t4, performance **432** of the contact center **400** recovers as the center's operations respond to the Intervention Manager **460** reducing the rate **510** of intervention delivery. After the Intervention Manager **460** changes the rate **432** to zero at t_3, performance **432** continues to decline before peaking at a minimum value and then improving. The time delay between setting the rate **510** to zero and the state **432** recovering may be due to interventions that are already in the delivery pipeline at time t_3.

At time t_4, contact center performance **432** is improving strongly towards passing the state level setting **480**. At this point, the Intervention

Manager **460** elects to reinitiate delivering performance interventions. During the time period **660** between time t_4 and time t_5, the Intervention Manager **460** ramps the rate **510** of delivering performance interventions more gradually than during the time period **640** between t_2 and t_3. This adjustment of the ramp slope illustrates the Intervention Manager **460** adapting to the fluctuations in the dynamic responsiveness of the contact center **400**.

At time t_5, the Intervention Manager **460** elects to deliver interventions at a constant rate. At the time period **670** between t_5 and t_6, contact center performance peaks and then begins to decline. By time t_6, performance **432** approaches the state level setting **480**. At this point, the Intervention Manager **460** begins to taper off the rate **510** of intervention delivery.

The rate reduction continues during the time period **680** between time t_6 and time t_7. At time t_7, the Intervention Manager **460** determines that the rate reduction is insufficient to maintain desired performance and sets the rate **510** to zero. The insufficiency of the prescribed rate reduction might result from a perturbation in the number of incoming calls, for example.

During the time period **690** between time t_7 and time t_8, contact center performance **432** increases above the state level setting **480**. At time t_8, the Intervention Manager **460** resumes delivering performance interventions. In one embodiment of the present invention, the Intervention Manager's algorithms **550** compute this rate **510** based on the contact center's response to previous rates **510**. In other words, the Intervention Manager **460** can analyze and learn from the reactions of the contact center **400** to earlier performance intervention deliveries.

In the time **695** following time t_8, the Intervention Manager **460** delivers interventions at a constant rate **510**. The performance **432** of the contact center **400** stabilizes to a level that is slightly above the state level setting **480**. As conditions in the contact center **400** fluctuate beyond time t_8 and as managers update management inputs **480**, the Intervention Manager **460** continues to adapt and respond accordingly. This flexible functionality serves both the need to

maintain operational performance at an acceptable level and the need to enhance the performance capabilities of the contact center's staff of agents **40**.

Figures 7A and 7B further illustrate the capabilities of the Intervention Manager **460** to adapt to changing conditions in the contact center **400** and to flexibly manage intervention delivery. These figures describe an embodiment of the present invention in which the Intervention Manager **460** manages intervention delivery based on forecasted contact center state **432**.

Figure 7A is a graph **700** that illustrates a projected state **432** of the contact center **400** from a current time, at hour zero, to eleven hours into the future. In this example, state **432** is average wait time, which is a performance metric that is typically a function of call volume. The graph **700** also presents a target state level **480**, which is typically established through management input **480** and is set to the exemplary value of fifteen seconds. The target state level **480** is the level below which it is desirable to maintain average wait time. In other words, from a performance perspective, less wait time is better, and the Intervention Manager **460** controls intervention delivery so that wait time is less than fifteen seconds.

The illustrated forecast **730** of average wait time **432** is a raw forecast that does not include any change in average wait time **432** that may result from the delivery of interventions under management of the Intervention Manager **460**. The forecast includes a time between hour one and hour seven during which the forecasted wait time falls significantly below the target level **480** of fifteen seconds. During this time, the Intervention Manager **460** has an opportunity to deliver interventions while maintaining acceptable wait time.

Figure 7B is a graph **720** that presents the actual, monitored wait time **740** in conjunction with the raw wait time forecast **730** and the target wait time level **480** of the graph **700** illustrated in Figure 7A. The combination of curves illustrates the Intervention Manager **480** using the lull in wait time as an opportunity to deliver performance interventions. In addition to establishing a rate **510** of delivering performance interventions, the Intervention Manager **460** can

elect to take other managerial actions that will consume wait time **730**. For example, the Intervention Manager **460** can use the lull as an opportunity to deliver longer performance interventions. Such actions can be taken in separately or in parallel with one another.

Between hours one and two, the Intervention Manager **460** begins delivering performance interventions or implementing other actions that consume the forecasted lull in wait time **730**. Subsequently, the actual, monitored wait time **740** responds to the delivery of interventions and thereby increases. The actual wait time increases from a forecasted wait time **730** of zero seconds to an actual wait time **740** of approximately twelve seconds, which is acceptably below the target level **480** of fifteen seconds. In anticipation of the forecast rise in wait time that occurs after hour six, the Intervention Manager **460** can stop delivering performance interventions. After the Intervention Manager **460** stops delivering performance interventions, the monitored wait time **740** settles to overlay the forecast wait time **730** at approximately hour eleven.

As an alternative to stopping the delivery of new performance interventions when, at approximately hour six, monitored state **740** increases above the state level setting **480**, the Intervention Manager **460** can opt to continue delivering time-sensitive performance interventions. For example, a critical performance intervention may need to be delivered before hour eleven. Although actual state **740** is unacceptable at hour seven, the forecast **730** indicates that state **740** will become progressively worse between hour seven and hour eleven. The Intervention Manger **460** can recognize that the conditions for delivery of the time-sensitive performance intervention are better at hour seven than any other time before hour eleven. In response, the Intervention Manager **460** can act to serve the contact center's operational effectiveness by rapidly delivering the time-sensitive performance interventions at hour seven.

Figures 7A and 7B illustrate the capabilities of the present invention to optimize resource utilization in the contact center **400** based on the forecasted availability of such resources. The depiction of state **432** in these

figures as average wait time **432** is exemplary. In alternate embodiments of the present invention, the state forecast **432** and the state level **480** are direct measurements of call volume or any other form of call center state **432**.

Figure 8 is another graphical illustration of an exemplary embodiment of the Intervention Manager **460** responding to fluctuating conditions in a contact center **400**. The graph **800** presents call center state **432** and rate **510** on a common timeline. In the embodiment supported by the illustrated functionality, state **432** is the percentage of calls connected to an agent **40** within the exemplary time of twenty seconds. Rate **510** is the percentage of pending performance interventions that are delivered in a time increment, such as an hour. In other words, rate **510** is the percentage of interventions that are delivered out of the total interventions that are eligible for delivery and for which delivery is sought.

Before time t_a, over 80% of the calls connect to an agent **40** within twenty seconds, and the Intervention Manager **460** is not delivering any interventions. At time t_a, the Intervention Manager **460** begins delivering interventions. Between time t_a and time t_b, the Intervention Manager **460** increases the rate **510** of intervention delivery from zero to seven percent. In response, the percentage of calls connected within twenty seconds falls to approximately 55%. At time t_b, the Intervention Manager **460** stops increasing the rate **510** of intervention delivery and holds it constant at seven percent for some period of time. Responsive to this steady seven-percent rate, the state **432** of the contact center **400** stabilizes to approximately 55%.

Figure 9 graphically illustrates the functionality of the Intervention Manager **460** in selecting interventions based on the state **432** of the contact center **400** in accordance with an exemplary embodiment of the present invention. The illustrated graph **900** presents the percentage of calls connected to an agent **40** within twenty seconds, along an x-axis timeline. This measurement of state **432** can be a monitored value or a forecast. In the plotted time, state **432** transitions from approximately 83% to approximately 47%.

Based on management input **480**, the Intervention Manager **460** maintains a table or similar data file that correlates acceptable intervention parameters **470** to state levels **480** defined by management input **480**. The figure depicts intervention priority as an exemplary intervention parameter **470**.

According to the table, the condition of 80% or more calls connected within twenty seconds, which is an exemplary time, satisfies the state-level criterion for delivering interventions having critical, high, medium, or low prioritization. For the time period **930** below time t_d, state **432** satisfies this criterion, and the Intervention Manager **460** may select a performance intervention for delivery from any of these prioritization levels if the intervention is assigned to at least one agent **40**.

State **432** between 70% and 80% is the criterion for delivering critical-, high-, and medium-priority interventions. The state during time period **940** between time t_d and time t_e satisfies this criterion. State **432** between 60% and 70% is the criterion for delivering critical-, and high-priority interventions. The contact center **400** meets this criterion between time t_e and t_f, and the Intervention Manager **460** may elect to deliver interventions from either prioritization category during this time period **950**. The table restricts the Intervention Manager **460** to delivering only critical interventions when state **432** is between 50% and 60%, as exhibited for the time period **960** between time t_f and time tg. When state **432** falls below 50%, as it does after time t_g, the Intervention Manager **460** refrains from delivering interventions.

Figure 10 illustrates an exemplary process for implementing the Intervention Manager **460** in accordance with an exemplary embodiment of the present invention. Algorithm **1000**, titled Intervention Manager Algorithm, computes intervention delivery rate **510**, intervention selection **520**, and agent selection **530** as a function of contact center state **432**, intervention parameters **470**, agent parameters **450**, and management input **480**. Algorithm **1000** incorporates Function F1 **550**, Function F2 **560**, and Function F3 **570**, which are described above, to perform the computations. The Intervention Manager **460**

provides the results of its computations to the intervention delivery system **430**, which delivers interventions following these results.

The first step **1020** of the Intervention Manager Algorithm **1000** is a process **1020**, titled Compute Rate and Selection, that includes Function F1 **550** and Function F2 **560**, which are algorithms illustrated in subsequent figures. Compute Rate and Selection **1020** receives contact center state **432**, intervention parameters **470**, and performance level settings **480** via the contact center network **54** and uses these inputs **432**, **470**, **480** to compute the rate **510** of intervention delivery and the selection **520** of interventions. Function F1 **550** is an algorithm, titled Set Delivery Rate, that computes the rate **550** of intervention delivery using the inputs **432**, **470**, **480**. Function 2 **560** is another algorithm, titled Select Intervention, that computes the selection of interventions using the inputs **432**, **470**, **480**.

The next step of Algorithm **1000** is an algorithm **570** titled Sequence Agents that selects **530** agents **40** to receive performance interventions. The Sequence Agents algorithm **570** computes the selection using agent performance and intervention assignment, which are agent parameters **450**, that are typically stored in the agent profiles database **449**. The selection computation illustrated in Figure 10 is an exemplary implementation of Function F3 **570** illustrated in Figures 5A, B, and C and described above.

At Step **1030** of Algorithm **1000**, the Intervention Manager **460** interacts with the intervention delivery system **430** to deliver interventions to the agents **40** selected in Sequence Agents **570**. Deliver Intervention Algorithm **1030**, which is illustrated in subsequent Figure 14, includes functionality that communicates the status of the contact center's agents **40** to other personnel and systems in the contact center **400**. Such communication supports coordinating processes in the contact center **400** to enhance operational efficiency of the center **400**.

Following Step **1030**, Algorithm **1000** calls Control Intervention Delivery **1040**, which facilitates the Intervention Manager **460** interacting with the

intervention delivery system while intervention delivery is underway. Through Algorithm **1040**, the Intervention Manager **460** can elect to terminate intervention delivery if dynamic conditions in the contact center **400** warrant such termination. For example, if contact center performance **432** dips to an unacceptable level, Algorithm **1040** terminates intervention delivery so that additional agents **40** can service contacts and improve performance **432**.

At decision Step **1050**, the Intervention Manager Algorithm **100** iterates the previous steps in the algorithm flow for each agent **40** of the contact center **400** for whom intervention delivery is applicable. That is, Algorithm **1000** continuously repeats unless all pending interventions have been delivered to all eligible agents **40**.

Figure 11 is a flowchart **550** illustrating the flow and steps of an exemplary embodiment of the Set Delivery Rate Algorithm **550** presented in Figure 10. The Intervention Manager Algorithm **1000** calls Algorithm **550** as part of its Compute Rate and Selection process **1020**. Algorithm **550**, as illustrated is Figure 11, is also an embodiment of the F1 Function **550** depicted in Figure 5B.

Exemplary algorithm **550** begins with receiving contact center state **432** in the form of contact center performance **432** and management input **480** in the form of a state level setting **480**. In the exemplary algorithm **550**, the state level setting **480** is a performance level setting **480**. In other embodiments of the present invention, Set Delivery Rate Algorithm **550** uses any of the forms of contact center state **432** and state level settings **480** discussed herein.

At inquiry Step **1120**, Algorithm **550** determines if contact center performance **432** is above or below the performance level setting **480**. That is, the Intervention Manager **460** determines if the performance **432** of the contact center **400** is suitable to deliver performance interventions at a certain rate **510**.

If performance **432** is above the state level setting **480**, then at Step **1140**, the Intervention Manager **460** instructs the intervention delivery system **430** to increase the rate **510** of delivering performance interventions. If performance **432** is below the state level setting **480**, then at Step **1130**, the Intervention

Manager **460** notifies the intervention delivery system **430** to reduce the rate **510** of delivering performance interventions.

In one embodiment of the present invention, Algorithm **550** includes multiple performance level settings **480**, each triggering a distinct rate **510**. In one embodiment of the present invention, rate **510** is a function of the difference between the contact center performance **432** and a performance level setting **480**. The computed rate **510** is related to the deviation between performance **432** and performance level setting **480**. The algorithm **550** computes a specific rate **510** that is proportional to the magnitude of the difference between performance **432** and performance level setting **480**.

In one embodiment of the present invention, the Intervention Manager **460** adjusts the performance level setting **480** to meet an intervention delivery goal of the contact center's management or other decision maker. In one embodiment, the Intervention Manager **460** notifies management if the current rate **510** of intervention delivery is insufficient to meet a managerial goal or deadline. If current constraints preclude delivering any performance interventions, then the Intervention Manager **460** notifies management that the performance level setting **480** needs adjustment, for example. In one embodiment of the present invention, the Intervention Manager **460** can elect to automatically adjust the performance level setting **480**.

In one embodiment of the present invention, the Intervention Manager **460** computes intervention delivery rate **510** based on one or more intervention parameters **470**. Figure 5C, which is discussed above, illustrates an embodiment in which Function F1 **550** of the Intervention Manager **460** computes rate **510** on the basis of contact center state **432**, management input **480**, and intervention parameters **470**.

For an embodiment as illustrated in Figure 5C, priority of intervention delivery is an intervention parameter **470** that affects the determination of delivery rate **510**. The Intervention Manager **460** can take measures to expedite the delivery of critical priority interventions. For example,

the Intervention Manager **460** can accelerate intervention delivery when the intervention profiles database **449** specifies that specific performance interventions have critical delivery requirements.

In one embodiment of the present invention, management can enter, as management input **480**, a deadline to deliver one or more specific performance interventions. The Intervention Manager **460** monitors progress towards meeting the deadline. If, as the deadline approaches, the Intervention Manager **460** determines that the existing rate **510** of intervention delivery is insufficient to meet the deadline, then the Intervention Manager **460** increases the rate **510** of intervention delivery.

Referring now to Figure 12, after the Intervention Manager Algorithm **1000** determines the rate **510** of intervention delivery, it calls Select Intervention Algorithm **560** to select one or more specific performance interventions for delivery. Algorithm **560** is an exemplary embodiment of Function F2 **560**, which is depicted in Figure 5B and Figure 5C. The flowchart **560** includes logic and computations that implement the functionality illustrated in Figure 9. That is, Figure 12 illustrates the algorithms behind the functionality depicted in Figure 9 and is generally consistent with Figures 5B and 5C.

Algorithm **560** performs the intervention selection **520** on the basis of performance level settings **480**, contact center performance **432**, and intervention prioritization. This data **480**, **432**, and **470** is available from management input **480**, the ACD **32**, and intervention profiles database **469** respectively.

At inquiry Step **1220**, Algorithm **560** determines if contact center performance **432** is above a management input performance level setting **480**. More specifically, Step **1220** determines if more that 80% of the calls into the contact center **400** are connected to an agent **40** within twenty seconds, which is an exemplary time. If the determination is positive, at Step **1225** Algorithm **560** selects a performance intervention having a critical, high, medium, or low categorization. In other words, when contact center performance **432** is at its

highest level, performance intervention selection **560** is not constrained to a specific intervention priority. At this performance, the Intervention Manager **460** can elect to deliver any performance intervention that is assigned to at least one agent **40**.

At inquiry Steps **1230**, **1240**, and **1250**, Algorithm **560** determines if contact center performance **432** is between 80% and 70%, between 70% and 60%, or between 60% and 50% respectively. If performance **432** is less than or equal to 80% and greater than 70%, Select Intervention **560** executes Step **1235** to select a critical-, high-, or medium-category performance intervention. Performance **432** less than or equal to 70% and greater than 60% is the criterion for Algorithm **560** to select a performance intervention from the critical and high categories of performance interventions. For performance less than or equal to 60% and greater than 50%, Step **1255** limits the Intervention Manager **460** to selecting performance interventions that are designated as critical. If the contact center **400** connects 50% or fewer calls to an agent **40** within twenty seconds, then, at Step **1260**, Algorithm **560** does not select any performance interventions for delivery until performance **432** improves.

If Algorithm **560** determines that the performance **432** of the contact center **400** is such that multiple performance interventions meet the selection criterion and thus qualify for delivery, then the Intervention Manager **460** can select one or more specific interventions from the qualifying group. That is, of the performance interventions that are assigned to at least one agent **40** two or more may qualify for delivery based on the criteria of Algorithm **560**.

In one embodiment of the present invention, the Intervention Manager **460** randomly selects one of the performance interventions from the group of qualifying interventions. In another embodiment of the present invention, input from a manager of the contact center **400** narrows the choices of performance interventions. In yet another embodiment of the present invention, the performance intervention with the highest priority is selected.

In another embodiment of the present invention, Algorithm 560 offers an agent **40** a menu of performance interventions from which the agent **40** can select one or more specific interventions. The menu can include performance interventions having various priorities, for example several high-priority interventions and low-priority interventions. The menu can provide an indication of priority as well as any approaching deadlines for completing time-sensitive interventions.

Turning now to Figure 13, after the Intervention Manager Algorithm **1000** determines the rate **510** of intervention delivery and the selection **520** of performance interventions, Algorithm **570** makes a selection **530** of one or more agents **40** to receive a performance intervention. Algorithm **570**, which is titled Sequence Agents Algorithm, is an exemplary embodiment of Function F3 **570** as illustrated in Figure 5B and Figure 5C. The agent profiles database **449** supplies Algorithm **570** with the performance of the agents **40** in the contact center **400** who are eligible to receive performance interventions. The database **449** also provides the algorithm **570** with the performance interventions that are assigned to each of these agents **40**.

At Step **1320**, Algorithm **570** uses agent parameters data **450** from the agent profiles database **449** to select the lowest performing agent **40** as the next agent **40** to receive a performance intervention. The Intervention Manager **460** notifies the agent delivery system **430** of the selected agent **530** and the performance intervention **520** selected by the Select Intervention Algorithm **560**. In compliance with these parameters **520**, **530** and a delivery rate **510**, the intervention delivery system **430** delivers the selected performance intervention **520** to the selected agent **530**.

In one embodiment of the present invention, the agent profiles database **449** includes a ranking of the relative performance of each agent **40** who is eligible to receive an intervention. That is, the contact center **400** maintains a list of agents **40** ordered by performance, from the best performing agent **40** to the worst performing agent **40**. The Intervention Manager **460** uses the ranked order

to compose a sequence of agents **40** to receive performance interventions. The sequence starts with the lowest performing agent **40** and sequentially progresses to higher performing agents **40**. In one embodiment of Algorithm 570, Step 1320 proceeds from the lowest rank agent **40** who has an assigned performance intervention. In one embodiment of the present invention, managerial personnel in the contact center **400** can specify specific agents **40** to receive performance interventions, for example overriding a computer-generated sequence.

Those skilled in the art appreciate that the present invention supports a wide range of methodologies for identifying a single agent **40** or a sequence of agents **40** to receive a performance intervention. For example, at Step **1320** in Algorithm **570**, the Intervention Manager **460** can elect to select an agent **40** who is average performer, but has an assignment with a rapidly approaching deadline.

Turning now to Figure 14, an exemplary embodiment of the Deliver Intervention Algorithm 1030 is illustrated. Deliver Intervention Algorithm **1030** communicates agent status information to systems in the contact center **400** to facilitate coordinated interactions between these systems and the contact center's agents **40**. At the top of the flowchart **1030**, the Intervention Manager **460** provides Algorithm **1030** with data specifying the next agent **40** selected to receive a performance intervention.

At inquiry Step **1410**, Algorithm **1030** determines if the selected agent **40** is either on break or is scheduled to be on break within a set period of time. In one embodiment of the present invention, the set period of time is one hour. In another embodiment of the present invention, the set period of time is a multiple of the length of the performance intervention.

If the selected agent **40** is not on break, then Algorithm **1030** executes inquiry Step **1420** to determine if the selected agent **40** is logged onto a terminal **44**. Algorithm **1030** executes Step **1430** if the selected agent **40** is on break, scheduled to be on break within a short period of time, or is not logged onto a terminal **44**. In Step **1430**, Algorithm **1030** notifies the Intervention Manager

460 to reschedule the performance intervention based on the selected agent's lack of availability to receive the intervention.

If at inquiry Step 1420 Algorithm 1030 determines that the selected agent 40 is free from breaks and is logged onto an agent terminal 44, then the algorithm 1030 acquires the agent availability status 435 from the ACD 32. Using this availability status 435, inquiry Step 1440 determines if the selected agent 40 is currently servicing a contact.

If the selected agent is not servicing a contact, then at Step 1460 the Intervention Manager 460 notifies the ACD 32 to log the agent 40 off from servicing contacts so the agent 40 is prepared to receive the intervention. If the selected agent 40 is servicing a contact, then at Step 1450 the Intervention Manager 460 waits until the agent 40 completes servicing the current contact and then notifies the ACD 32 to log the agent 40 off from contact-service duties.

At Step 1470, the ACD 32 has suspended the agent's contact servicing activities and the agent 40 is prepared to receive the performance intervention. At this point, the Intervention Manager 460 notifies the intervention delivery system 430 to commence delivering the performance intervention to the selected agent 40. When the notification is successful, Algorithm 1030 ends and the process of controlling intervention delivery 1040 begins.

In one embodiment of the present invention, the log-off process from the ACD 32 is a manual process. That is, rather than automatically or unilaterally logging off the agent 40 from his/her terminal 44, the process requires manual intervention by the agent 40. In this manner, the agent 40 may opt to not log off and accept a performance intervention; rather, the agent 40 may choose to continue servicing contacts or engage in another discretionary activity. Also, the agent's interaction with the ACD 32 can include the agent 40 notifying the ACD 32 of his/her availability to receive a performance intervention. That is, the agent 40 can send notification that he or she is amenable to a performance intervention at a specific time that can be defined by the Intervention Manger 460.

In one embodiment of the present invention an agent **40** can, when prompted to receive a performance intervention, delay delivery for a predetermined length of time, such as ten minutes. After the predetermined length of time has lapsed, the agent **40** can receive another request to accept a performance intervention. The agent **40** can respond by again delaying delivery. The cycle can repeat indefinitely or alternatively can terminate after a specified number of iterations.

Figure 15 is a flowchart that illustrates an exemplary embodiment of Algorithm **1040**, titled Control Intervention Delivery Algorithm, which initiates after Algorithm **1030**. Monitored contact center performance **432** and management input performance level **480** are two inputs to the exemplary embodiment of Algorithm **1040**. At inquiry Step **1510**, Algorithm **1040** determines if the monitored performance **432** is above the performance level setting **480**. If the performance **432** is above the performance level **480**, then the contact center's operational performance is acceptable and the Intervention Manager **460** does not interfere with the intervention delivery system's intervention delivery.

If inquiry Step **1510** determines that monitored performance is unacceptable, then Algorithm **1040** accesses an agent termination order **1530**. In one embodiment of the present invention, the termination order **1530** is a management input **460**. In another embodiment, the termination order **1530** is a random sequence. In yet another embodiment, the termination order **1530** is a derivation of the length of time since each agent **40** has received a performance intervention. For example, the agent **40** who most recently received a performance intervention is the first agent **40** in the termination order **1530**, and the agent **40** who has not received a performance intervention for the longest period of time is the last agent **40** in the termination order **1530**. The agent termination order **1530** can also be based on a rank of agent performance, a last-in-first-out sequence, a first-in-last-out sequence, or another methodology that serves the operational goals of the contact center **400**.

At Step **1540**, the Intervention Manager **460** instructs the intervention delivery system **430** to terminate intervention delivery for the first agent **40** on the agent termination order **1530**. At Step **1550**, the Intervention Manager **460** notifies the ACD **32** to log the terminated agent **40** on a terminal **40** to resume servicing contacts.

After executing either Step **1520** or Step **1550**, Algorithm **1040** acquires fresh monitored state data **432** and iterates the process of determining if performance is acceptable and acting on that determination.

Algorithm **1040** supplements the functionality of the previous steps in the Intervention Manager Algorithm **1000** by providing an increased level of responsiveness to dynamic conditions in the contact center **400**. That is, in addition to establishing the parameters **510**, **520**, **530** of intervention delivery, the Intervention Manager **460** intervenes with the delivery process if conditions in the contact center **400** become unacceptable or otherwise unsuitable for delivering performance interventions.

An exemplary embodiment of an Intervention Manager Algorithm **1000** has been described in conjunction with exemplary Functions F1, F2, and F3 **550**, **560**, **570**. Those skilled in the art recognize that the present invention supports adapting these functions **550**, **560**, **570**, both in functionality and in sequence of implementation, to achieve a wide range of functional objectives and purposes related to managing intervention delivery in a contact center **400**.

In summary, the present invention supports managing the rate of delivering performance interventions to agents in a call center to enhance the capabilities of the agent population while maintaining robust performance of the contact center.

From the foregoing, it will be appreciated that the preferred embodiment of the present invention overcomes the limitations of the prior art. From the description of the preferred embodiment, equivalents of the elements shown therein will suggest themselves to those skilled in the art, and ways of constructing other embodiments of the present invention will suggest themselves

to practitioners of the art. Therefore, the scope of the present invention is to be limited only by the claims below.